OP-259 [Beekeeping Technology and Quality]
Field experiment to test food supplements for honey bee colonies. Can we expect significant results at a reasonable cost?

Michel BOCQUET[1], Maja Ivana Smodiš Škerl[2]
[1]Apimedia, Annecy, France
[2]Agricultural Institute of Slovenia, Ljubljana, Slovenia

More and more nutritional supplements appear in the market, with various allegations poorly supported by scientific studies. In the frame of the Coloss NutriTask Force, the BeeQualiFeed project is working on methodologies to evaluate the quality of food supplements for bees. A specific challenge is related to field experiments in testing the supplements, which often show poor results as numerous factors interfere with nutritional quality. In this study, we aim to evaluate how to approach such an experiment to come to a result, at a reasonable cost. We compared a commercial product BeeElixir, to sugar syrup and honey as controls in order to understand the impact of feeding on overwintering success in the conditions of temperate climate in Center-East of France. We observed slight differences among the experimental conditions in each of the studied variables (e.g. survival, consumption, strength of the colonies post wintering), but the overall overwintering success shows a significant result in favor of the commercial product. We discuss several points: (1) the specific case of honey, that came at the lowest rank, (2) the management of a large number of automatic scales, (3) the cost of that kind of study,and (4) the strong impact of the specific climatic conditions of the experiment. We conclude on the challenges of experimenting in the field with food supplements for bees, and open new ideas on the way to improve the knowledge on the aliments for bees, in relation to the quality of the bee products.

Field experiment to test food supplements for honey bee colonies

Can We Expect Significant Results at a Reasonable Cost?

Michel Bocquet[1] & Maja Ivana Smodiš Škerl[2]

[1]Apimedia, Annecy, France;
[2]Agricultural Institute of Slovenia, Ljubljana, Slovenia

Growing number of nutritional Supplements for bees

A growing number of nutritional supplements are entering the market with unsubstantiated claims. Field experiments to test these supplements often yield poor results due to numerous interfering factors.

Our study, in the frame of the **Coloss Nutri-TaskForce-BeeQualiFeed project**, is part of a program that aims to establish reliable methodologies for evaluating food supplements for bees.

In this pilot experiment,

- The product to test was BeeElixir (a commercial product of BeeVital – BeeVital participated to the costs)
- The control group was Sugar syrup
- A second control group was used in the lab conditions (Spirulina) and in the field experiment (honey).

Coloss NutriTask Force

https://coloss.org/activities/nutrition/

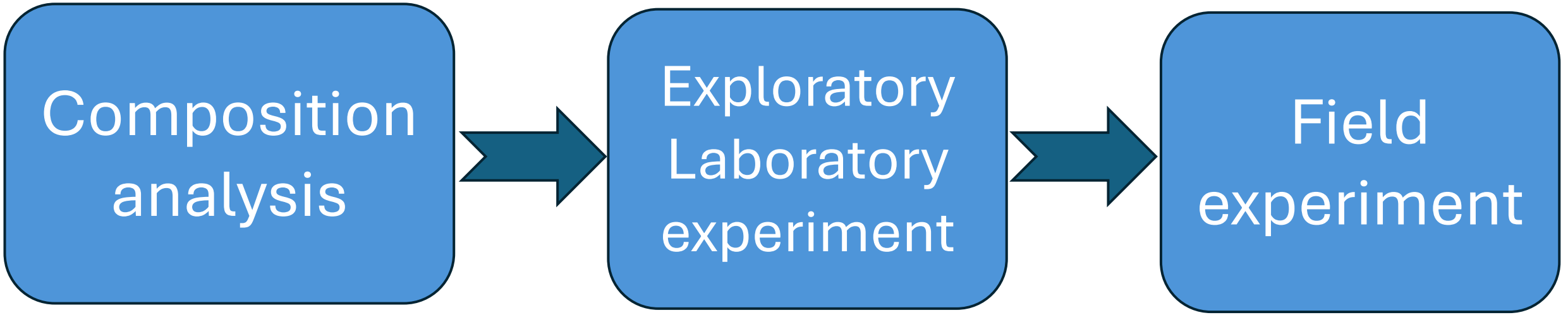
Formally started in 2019 (Kick off meeting: 15th COLOSS Conference, 2019, Montreal)

Gather worldwide experts or laboratories interested in “bee nutrition”

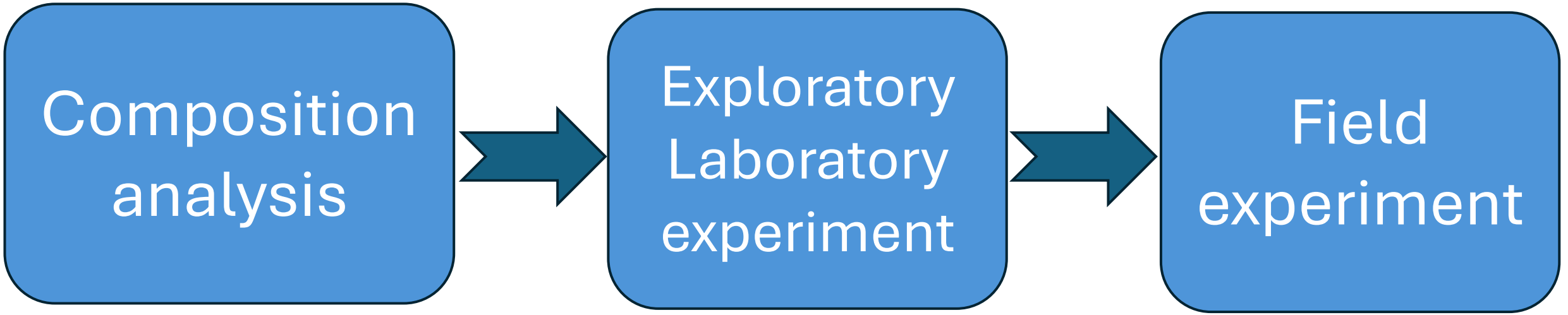
Bocquet & Tosi (2022) ; A New COLOSS Task Force : Bee Nutrition ; Bee World, 99:1, 35-36 https://doi.org/10.1080/0005772X.2021.20006

Falcão, S.I.; Bocquet, M.; Chlebo, R.; Barreira, J.C.M.; Giacomelli, A.; Smodiš Škerl, M.I.; Quaglia, G. Composition and Quality of Honey Bee Feed: The Methodology and Monitoring of Candy Boards. *Animals* **2024**, *14*, 2836. https://doi.org/10.3390/ani14192836

How to evaluate a BeeFeed ?



How to evaluate a BeeFeed ?



- Amino Acids

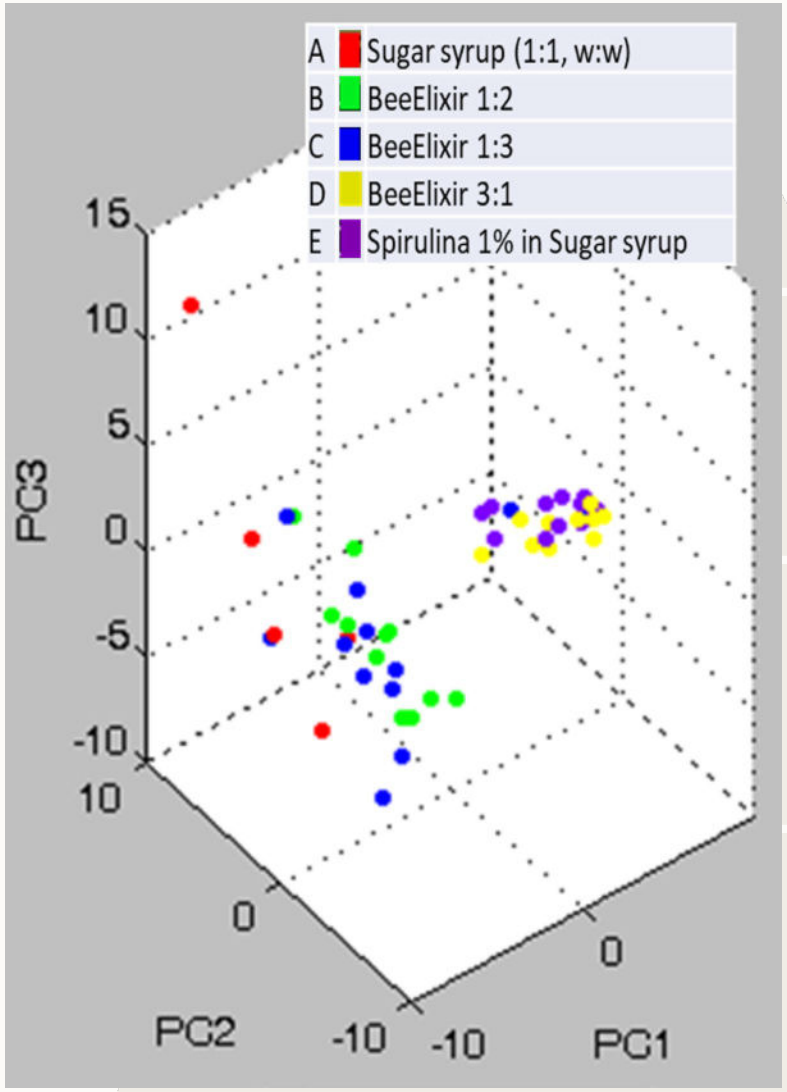
- Survival
- Body Mass
- Maldi Bee-Typing

- *Control- Sugar syrup*
- *Control + Spirulina*

- Survival
- Varroa/Nosema
- Population dynamics
- Consumption
- Body mass

- *Control- Sugar syrup*
- *Control + Honey*

Focus on MALDI Analysis of Bee hemolymph



TRIAL 1

Clear Separation

Syrup-fed bees distinct from concentratedBeeElixir and Spirulina groups.

Intermediate Group

Diluted BeeElixir closer to syrup control group in molecular profile.

Antimicrobial Peptides

High levels of Apidaecin and Abaecin in Bee Elixir 1:2 and 1:3.

Low Peptide Levels

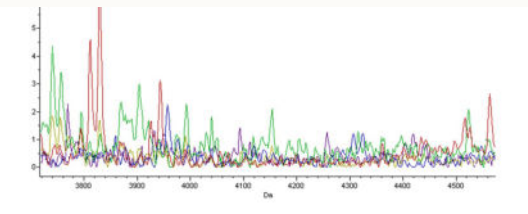
Other experimental conditions showed low levels of antimicrobial peptides.

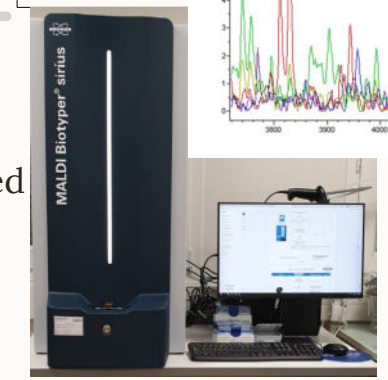
What is Maldi BeeTyping ?

A Mass spectrometry analysis that gives a peptide profile of bee hemolymph in the range 800-18 000 m/z.

This technique provides an accurate view of immune and peptidomic status of the honey bee.

It can be used in experimental designs to verify if the experimental conditions are different or not, to evaluate the immunity level of the bees and to give a idea of the Bee health status.





Made with Gamma

Laboratory experiment

Key Findings and Observations

Kmetijski inštitut Slovenije
Agricultural Institute of Slovenia

1

Survival Rates

Spirulina demonstrated the highest survival rates in laboratory trials, outperforming both BeeElixir and the sugar syrup control.

2

Hemolymph Profiles

Clear separation observed between sugar-fed bees and Spirulina-fed bees. Pure BeeElixir showed similarity to Spirulina profile, while diluted BeeElixir was closer to sugar-fed bee profiles.

3

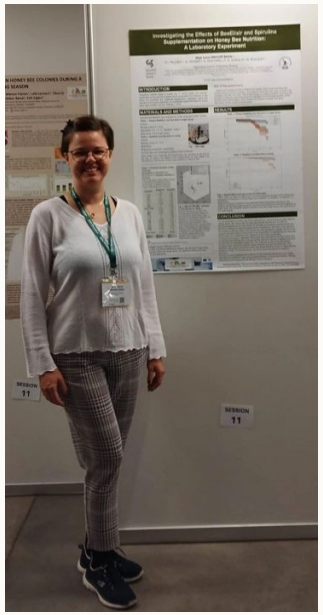
Amino Acid Composition

Spirulina contained most essential amino acids, indicating its potential as a comprehensive nutritional supplement for honey bees.

4

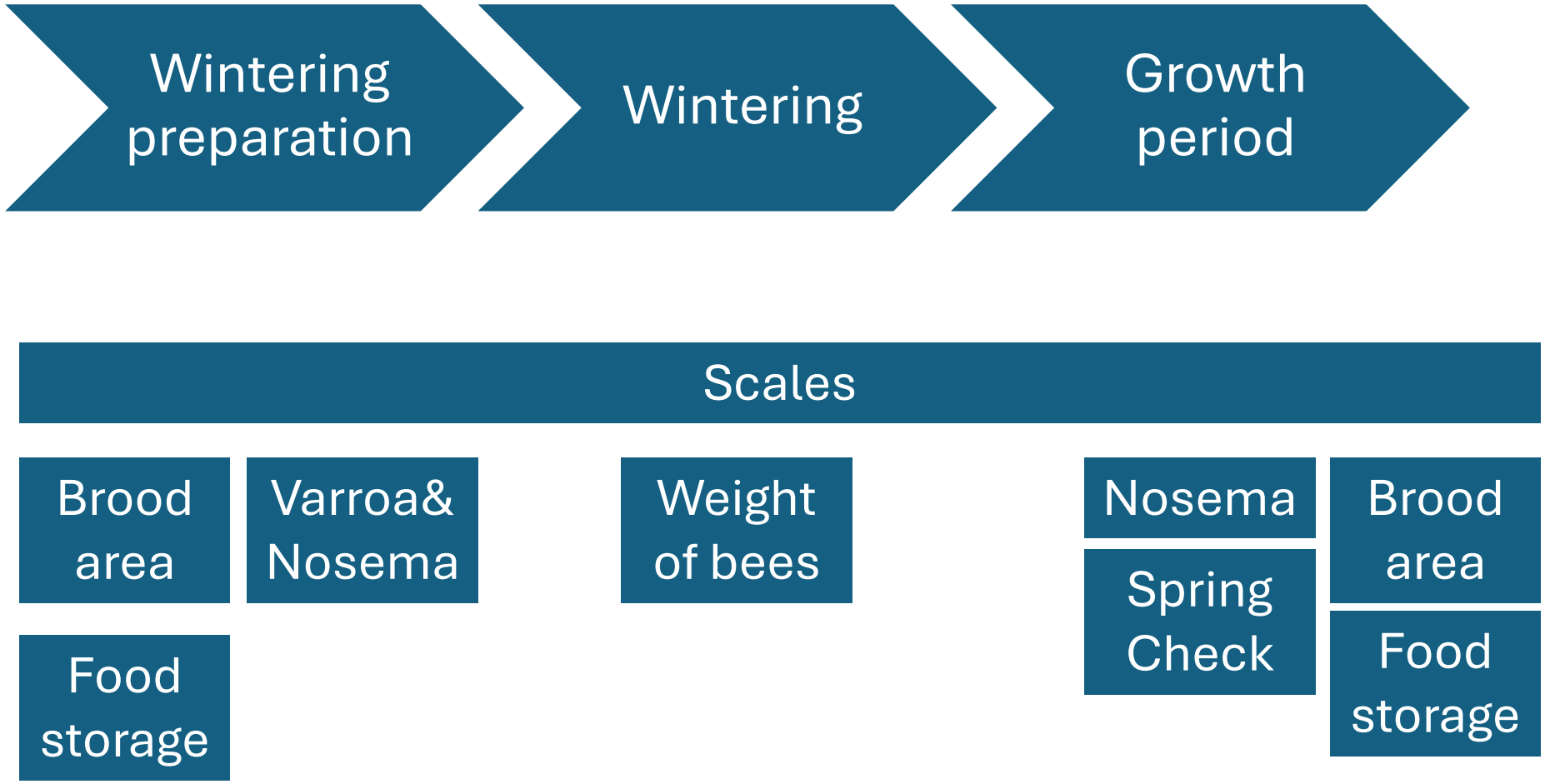
Antimicrobial Peptides

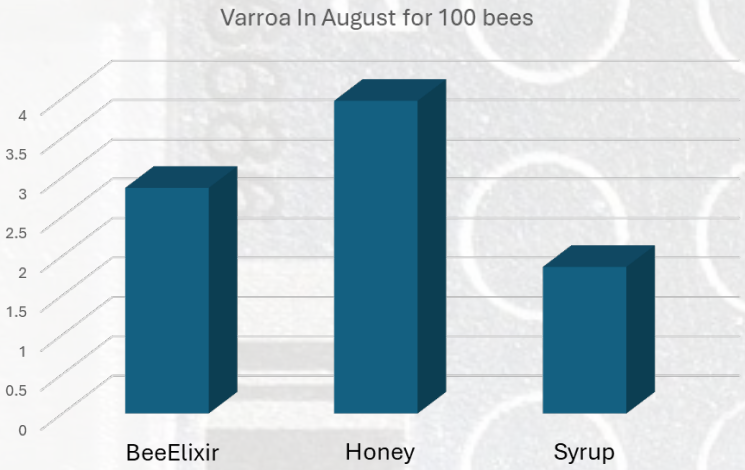
Higher levels of Apidaecin and Abaecin detected in certain BeeElixir concentrations, suggesting potential immune-boosting or rather alarming properties

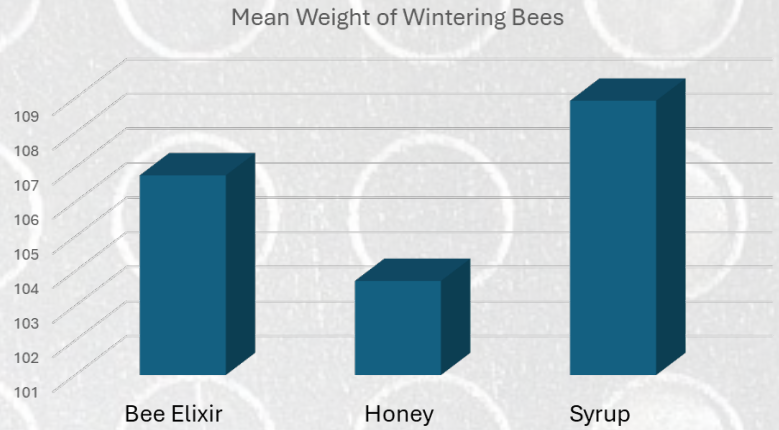


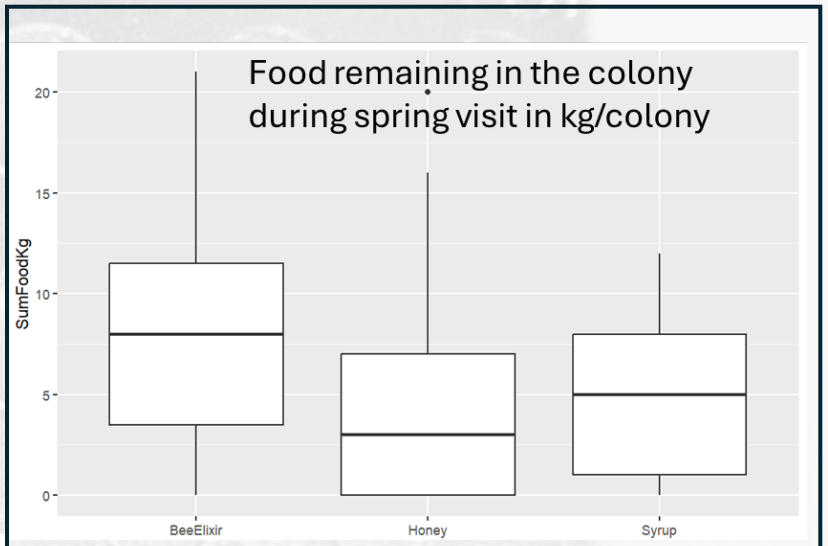
Maja Ivana Smodiš Škerl, Poster in Eurbee

Field Wintering experiment

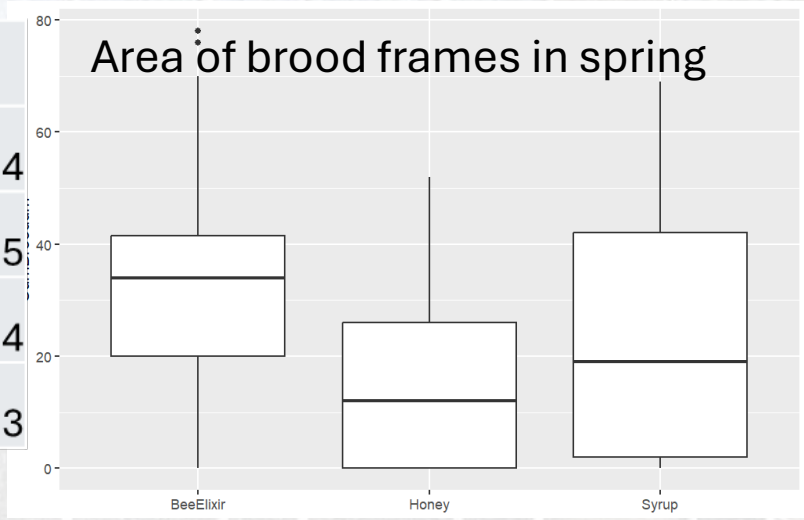


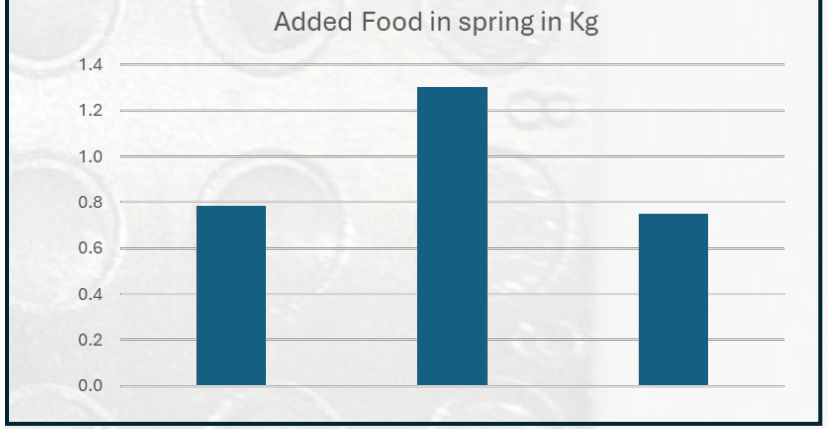






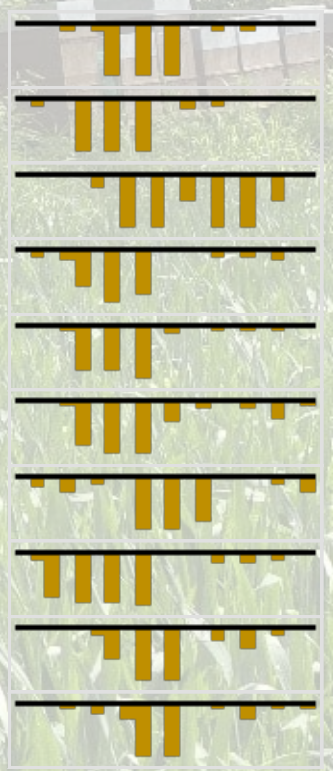
	Dead	alive	total	% of losses
BeeElixir	3	32	35	9.4
Honey	4	17	21	23.5
Syrup	4	23	27	17.4
Total	11	72	83	15.3





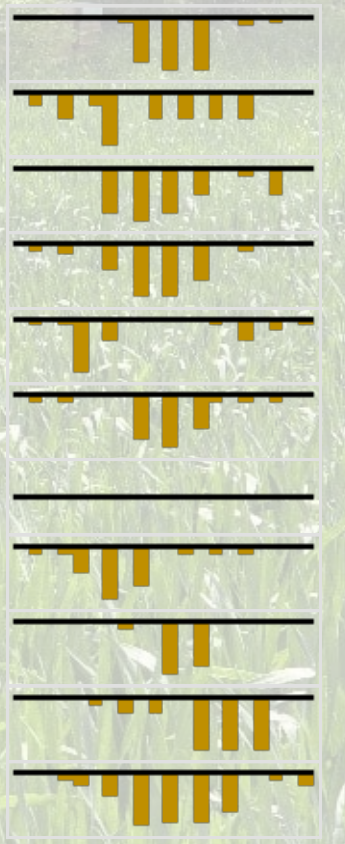
Colony dynamics - Spring visit

Bee Elixir

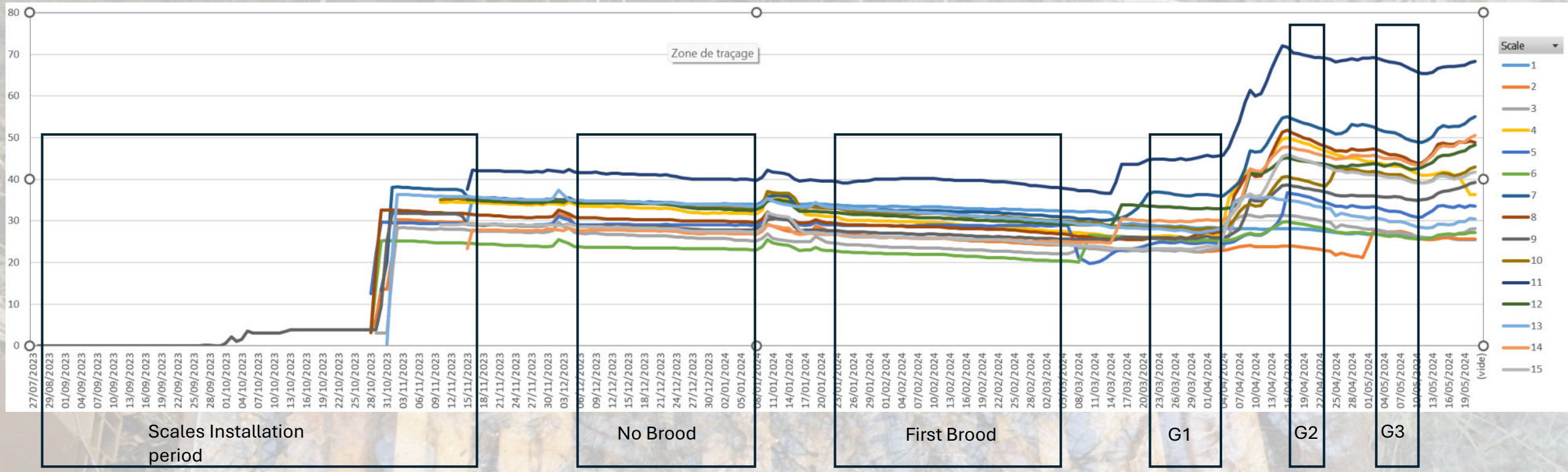


Honey

Sugar



Key result : **BeeElixir** shows more regular profile than sugar. The same for honey for the surviving colonies



(In g/day)

	Honey	Sugar	BeeElixir
No brood (05/12/2023 – 05/01/2024)	-39.6	-37.8	-47.8
First brood (25/01/2024 – 05/03/2024)	-41.4	-47.3	-55.2
G1 (25/03/2024 – 02/04/2024)	-15.8	39.9	-8.9
G2 (16/04/2024 – 22/04/2024)	-199.7	-284.6	-310.5
G3 (03/05/2024 – 10/05/2024)	-199.9	-230.7	-300.7

Scales management is a challenge

- To install 15 scales (getting a full palette, charging the batteries, understand the functions, protect some of the devices, identifying the balances to be easy in the field) => 4 days. The initial invesment is huge
- To follow the scales => recharging every year, need various chargers by apiary.
- To manage the data => Downloading the data takes some hours
- To devolve the scales (cleaning the scales, gathering in the original boxes, sending the pallet) => 2 days

42M02843	9035-FR	Pringy	2131M
42M02828	9036-FR	Pringy	2012B
42M02823	9038-FR	Pringy	2132S
42M02919	9052-FR	Marigny	2030S
42M02920	9053_FR	Marigny	2206M
42M02878	90113-FR	Marigny	2171B
42M02697	9039-FR	Vetraz	2191S
42M02824	9017-FR	Vetraz	2190B
42M02881	90112-FR	Vetraz	2189M
42M02826	9051-FR	Ville-la-Grand	2165M
42M02900	90514-FR	Ville-la-Grand	2163S
42M02884	90511-FR	Ville-la-Grand	2162B
42M02852	90110-FR	Archamps	2076M
42M02897	90115-FR	Archamps	2193S
42M02857	9034-FR	Archamps	2192B

Key points :

- Not so easy to manage this number of scales
- Colony changed with the same experimental condition if dead

Overwintering success

- We observed rather differences across the variables (survival, consumption, strength) but usually in field conditions the differences are small.
- However, the **overall overwintering success was significantly higher for the BeeElixir group.**

Theoretical example :

Initial colonies	**>after mortality>**	**brood frames>**	**honey collection>**	**global gain**
100	**91**	**2**	**20**	**38,220 €**
100	**83**	**1**	**20**	**32,370 €**

Hypothesis = 18€/kg 30€/frame

+ Better health ?

⇒But in the context of high losses, the bees are managed differently,

- ⇒Changing the queen of weak colonies
- ⇒Adding a brood frame
- ⇒Gather two weak colonies
- ⇒Extracting a brood frame

Take home message

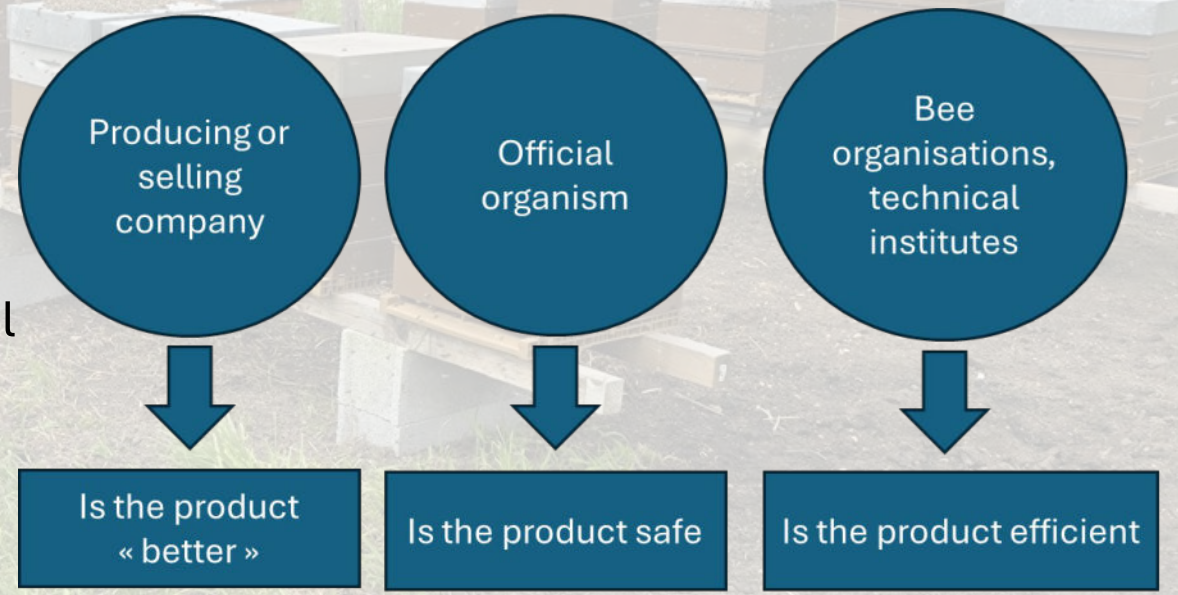
- Lab analysis is interesting but may not have the same results as field experiments
- Field experiment have to be repeated at least three years as the variability among the years is important and have triplicate of apiary at least.
- Honey as a control food is not ideal = need to bring the honey from other colonies (you may have honey ! Not the case in the second year experiment) and we have not the stimulating effect so less results.
- We should test MALDI-BeeTyping in the field conditions to see the levels of immunity in each experimental condition and evaluate health status
- We may explore more field and laboratory parameters to better evaluate the differences between the experimental conditions.

Next steps

- Exploring more parameters
- Comparing different products in the market

But => more experimental conditions => much more colonies => who pays ?

- Selling comany ? => needs data for commercial team
- Technical institute ? => comparative studies
- Beekeepers ? => it is always beekeepers, **the market talks**



Thanks for your attention !

Apimondia QR Contact

Michel BOCQUET
apimedia@aol.com